

ASCO 7000 SERIES Generator Paralleling Control Switchgear



ASCO®


EMERSON™
Network Power



DISCOVER THE AWESOME POWER
OF THE ASCO LOW VOLTAGE
7000 SERIES GENERATOR PARALLELING
CONTROL SWITCHGEAR



You're in Total Command

The ASCO 7000 SERIES Generator Paralleling Control Switchgear is the world's most intelligent and advanced multiple-engine power control system.

It can be custom engineered to meet the specific requirements of any project in a wide range of emergency power applications... from industrial/commercial to

large healthcare and business-critical facilities. The 7000 SERIES system is based on state-of-the-art digital control technology to synchronize, manage and

parallel engine-generator sets. It provides sophisticated engine control, load management and communications capabilities, including unsurpassed power system monitoring and protection.

OPERATIONAL MODES :

- PRIME POWER
- EMERGENCY/AUTOMATIC STANDBY POWER
- UTILITY PARALLELING



System Highlights

7000 SERIES Generator Paralleling Control Switchgear For Mission-Critical and Healthcare Applications

Standard Integrated Features :

- 115-600V, 3-phase, 4-wire, 100% neutral, 25% copper ground bus, 50/60 Hz, AC system
- UL 1558 construction, listing and labeling
- Master control: 12" color touch screen operator interface panel
- Generator PLC redundancy
- Two manual paralleling provisions
- Load control for up to 128 power transfer switches/circuit breakers
- Load demand and bus load optimization controls
- No traditional (external) load share components are required
- Serial modbus RTU (Master/slave RS485/RS232 ports or Ethernet communication capability with power transfer switches and SCADA system)
- Event log and historical date trending



Custom Configuration Design Options :

- Up to 10,000A silver plated main bus with up to 200kAIC bracing level for four cycles
- Generator breaker frame size – up to 5,000A
- Enclosure types: NEMA 1; NEMA 3R
- Bus duct risers up to 6,000A
- Top or bottom conduit entry
- Unlimited number of engine generators for parallel operation
- Color touch screen panels for the generator controls
- Master PLC redundancy: Hot standby or hot standby synchronized
- 42-in. LCD graphic display panel – integrated into the switchgear line-up and/or stand alone - wall mounted
- Two types of the remote annunciation panels available (LED or touch screen type)
- Up to two remote annunciation panels for each system, located up to 6,560 feet from switchgear
- Any specified circuit breaker brand
- Electrically and/or manually operated distribution circuit breakers
- Communication with building management network for monitoring via Data Concentrator or firewall
- Internet/intranet connectivity via ASCO Thin Web Server
- Extended switchgear warranty – up to 5 years

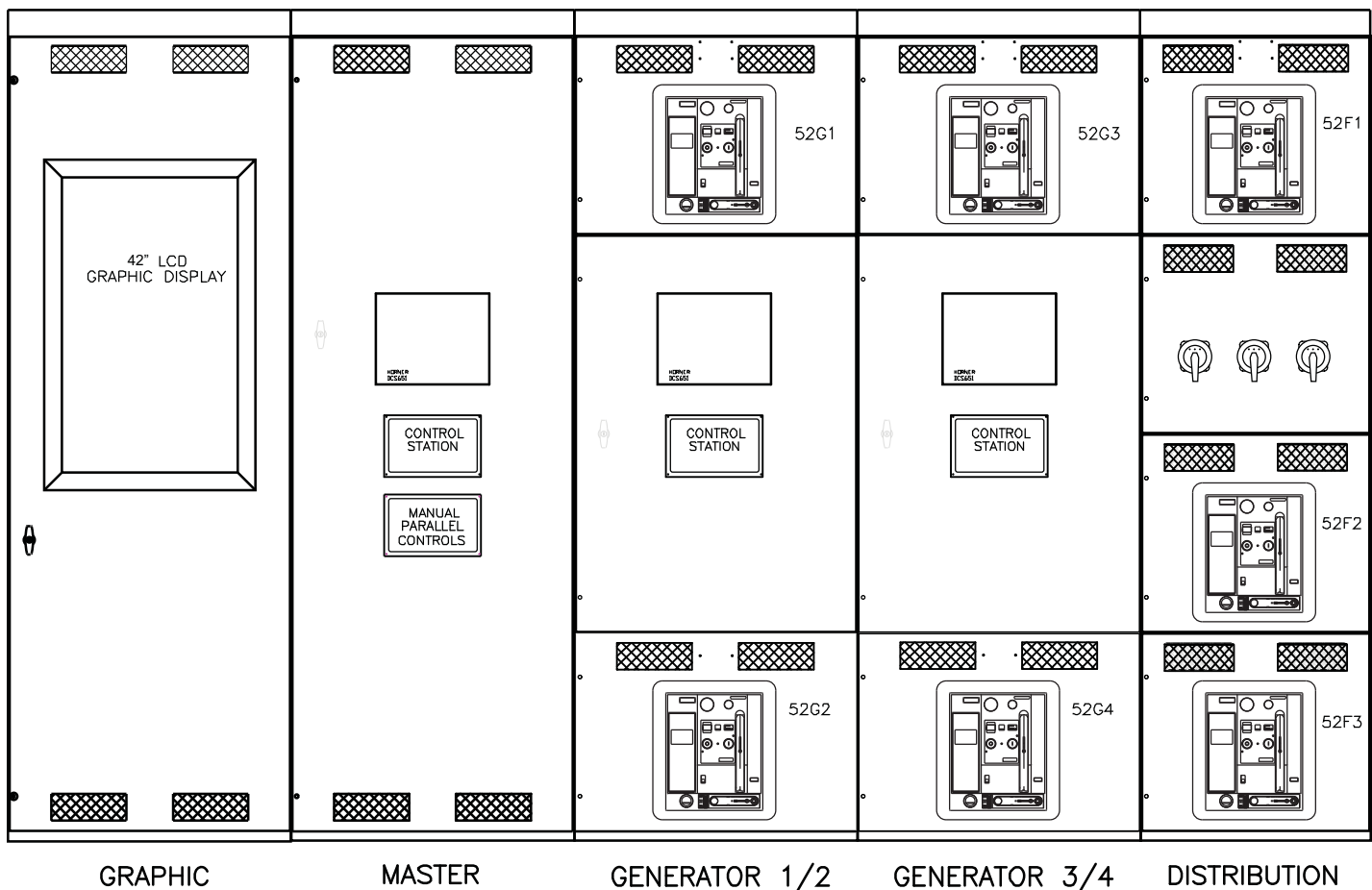


Fig. 1

A Smart 24 x 7 x 365 Power Guard

The 7000 SERIES Generator Paralleling Switchgear Stands Ready 24 x 7 x 365, Ensuring Immediate and Reliable Response to a Loss of Utility Power.

When normal source power fails... the switchgear power control system (PCS) will start all engine-generators when the power transfer switches sense a power outage. The first generator to achieve an acceptable level of voltage and frequency connects to the emergency bus. A PCS signal initiates connection of the priority one loads to the emergency bus. The switchgear then synchronizes

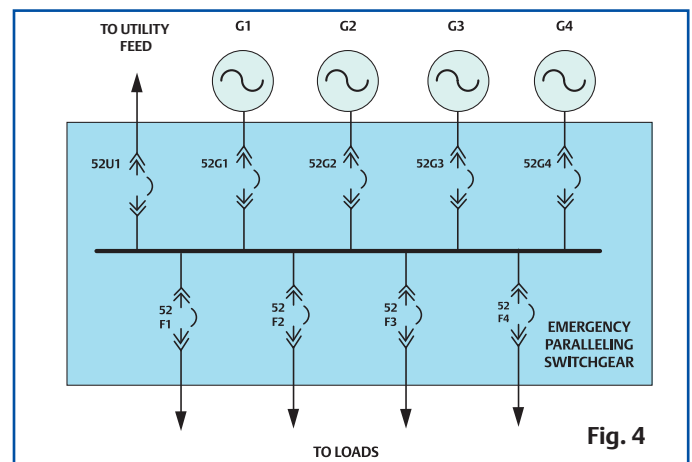
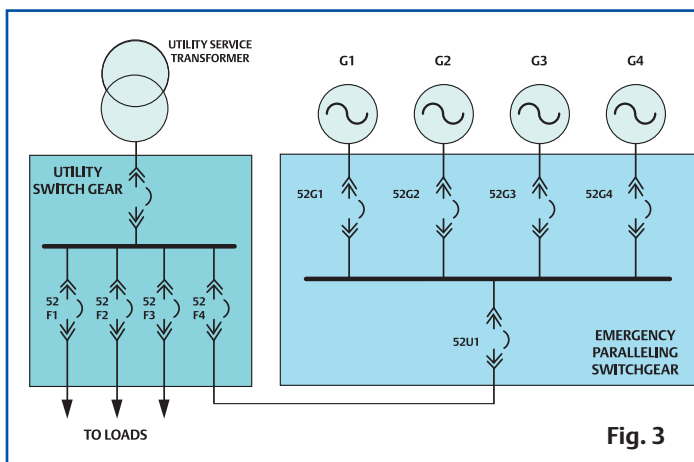
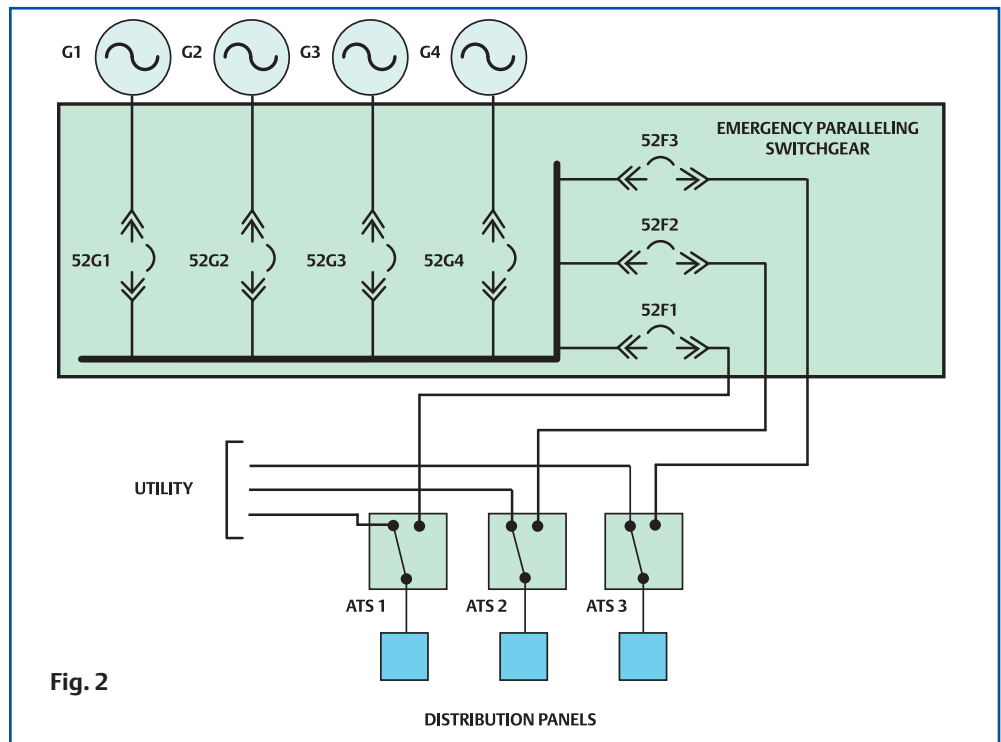
the remaining generator(s), connects each to the bus... and signals all power transfer switches to connect priority loads to the emergency source in a user-defined priority sequence.

If a generator fails... the system automatically disconnects it from the emergency bus, shuts it down and signals the associated lowest priority loads to shed.

Typical Applications:

The elevation (Fig. 1) and one-line diagram (Fig. 2) show a typical, four engine-generator paralleling system for automatic standby operational mode.

(Figs. 3-4) show typical systems with four generators for utility paralleling operational mode.



Load Demand ... is a load management feature that automatically determines and keeps the minimum required number of generators online to carry the actual kW load, conserving fuel and reducing engine run time.

Bus Load Optimization... automatically sheds blocks of load to prevent overloading of the remaining

generators, and automatically re-adds individual loads to the bus per a prescribed sequence according to their priority value if any generator fails.

Parallel with Utility... can be added to the standby and prime power PCS automatic closed-transition operational mode that helps

reduce energy costs by shaving your facility's peak energy demand and/or export/import power to/from the electric utility.

When Normal Source Power Is Restored...

each ATS senses a utility source that is within tolerance and, after a time delay, individually re-transfers to the normal position. When the last ATS has re-trans-

ferred to the normal position, the PCS will simultaneously open the generator breakers and allow running to their programmed cooldown period... PCS is now back to Automatic Standby/ (or Utility) Mode.



ASCO is the global leader in power switching and controls

Creative, responsive, customer - focused and competitive.



Our Innovative Design and Development Engineering Team

is a carefully selected combination of experienced engineers with decades of accomplishments and advanced degrees, and the most recent college graduates in power engineering.

As one team, they successfully apply cutting-edge technology to research, develop and quickly implement new paralleling switchgear/power switching and controls solutions.

ASCO's state-of-the art large power laboratory allows new equipment prototype and performance testing under real conditions. This helps qualify designs under listing agency standards.

Dependable Project Management

is provided by more than 20 regional project managers.

Each project manager is accountable for the total satisfaction of customers—electrical contractors, owners, construction managers, consulting engineers, engine-generator dealers, channel partners and others.

He ensures that all of his projects are completed accurately, ontime and meet the quality standards expected by his customers at each stage—submittals, approvals, all drawings, changes, deliveries, interfaces, start-ups, etc.

Our Professional Product Management

teams are a vital bridge between engineering and sales. That's why every ASCO Power Switching and Controls product line has a dedicated manager.

ASCO Product Managers have experience in power switching and control design and applications engineering. They also know how to develop products that respond to evolving customer needs so they can effectively drive our design teams to create the next-generation of PCS switchgear technology, ensuring our continued market leadership.

Knowledgeable Applications Engineering and Sales Forces

are large enough to cover all regions nationwide and internationally. Applications engineers are well-trained, highly-skilled and ready to sat-

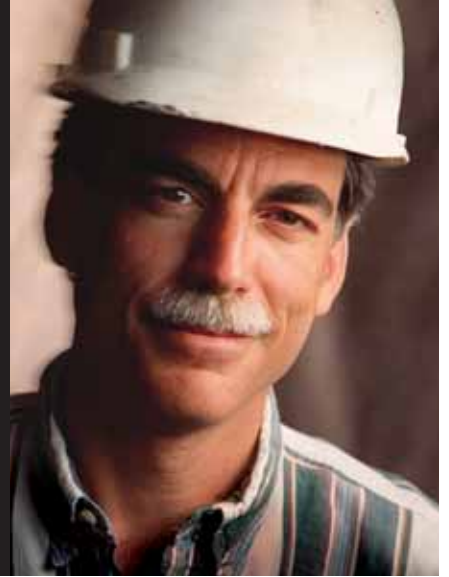
isfy your particular power control requirements. Every member of the applications engineering team provides technical support and quotations for any power switching and controls product regardless of voltage class, product type or application.

Best-in-the-Industry Field Service

is provided by more than 100 skilled technicians who properly maintain and test power control systems and transfer switches coast to coast.

Emergency service is dispatched and technicians are available 24/7 in most areas. Fully stocked ASCO vans support them during on-site visits, including switchgear startups.

Maximum reliability and excellent value



PCS Switchgear Design Supports Reliable Operation

- **Dedicated Master Controls** send engine start signals to generators and provide load management within entire emergency power system. In the event the Master PLC fails, the master controls will still issue engine start signals allowing all loads to be energized by closing breakers manually or by initiating ATS's transfer automatically
- **Master PLC Redundancy** is available for hot standby or hot standby synchronized
- **Two Manual Paralleling Provisions** are a touch screen with a synchroscope and additional push-buttons mounted on the Master Section door
- **Best Battery System** circuitry selects the best DC source among the generator starting batteries to provide regulated control power to the Master and all Generator controls, including PLC's (even during engine cranking). Also, any engine battery can feed the paralleling circuit breaker shunt trip if that engine battery has failed
- **Priority Load Control** automatically adds load to the generator bus as generators come online, and shed load as kW load capacity decreases. Loads are added in an optional stepping fashion to minimize transients on the engine generator and the system bus
- **Manual Load Shed Bypass** allows operator to manually re-add previously shed load via push-buttons. In the event of operator error, the controls will protect the power system – subsequent overload will automatically re-shed load detected by bus under frequency
- **Bus Load Optimization** allows automatic shed block(s) of load shedding when any generator online fails to prevent overloading of remaining generators and re-add loads to the system bus according to their priority value and a prescribed user selectable sequence
- **Generator Controls** can be designed within dedicated individual generator sections or dual generator sections. In both approaches, the controls enable generator PLC redundancy – if one generator PLC fails the second generator PLC takes over. The generator PLC provides engine start/stop, cranks the engine, monitors engine alarms and shutdowns and controls the paralleling breaker
- **Multiple (Master OIP type) Touch Screens** are available for the generator controls
- **Firewalled Communication** facilitates communication with building management monitoring networks via Ethernet data and/or Concentrated (Gateway PLC) Modbus

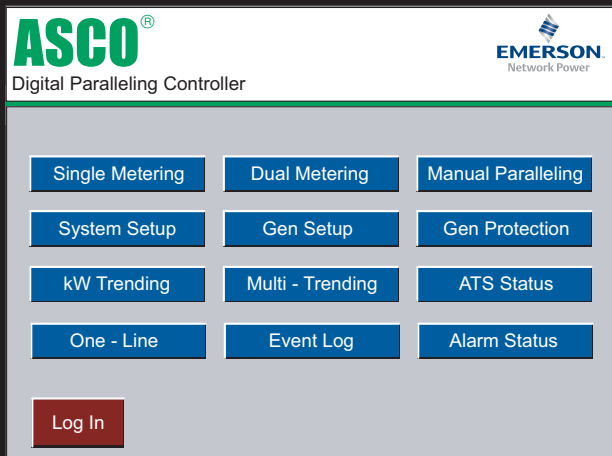
The heart of ASCO's Power Control System is a fully integrated Digital Paralleling Controller with cutting-edge technology

ASCO Digital Paralleling Controller (DPC)

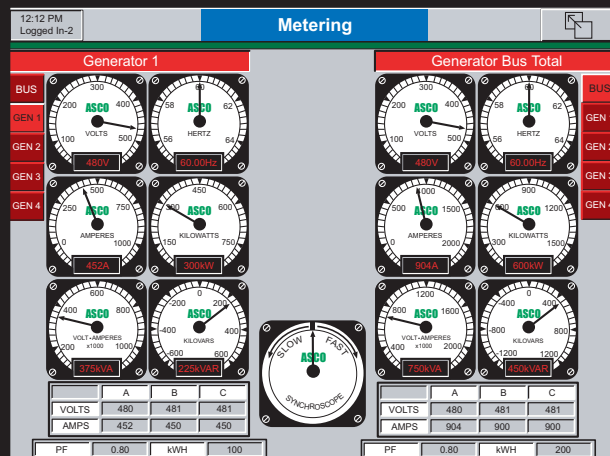


The controller uses a real-time operating system and offers the following advantages:

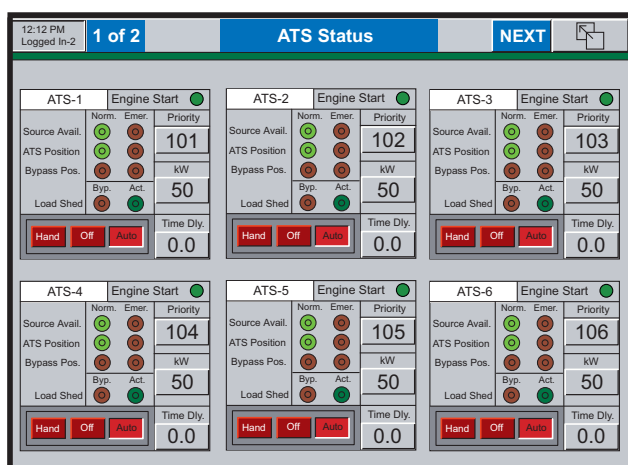
- Hot-backup programmable logic controller (PLC) capability.
- True RMS sensing for power metering with the two, 3-phase 600VAC and two, 3-phase 0-5A inputs.
- Customized programming including screens using ladder logic from a single software package.
- Complete generator control logic with ATS intelligent power transfer, soft loading and unloading, base load and import/export operations.
- Manual paralleling with graphical synchroscope.
- Graphical 270-degree gauge-type meters for power instrumentation. Compare two generators together and generator with a total bus on one screen.
- Electrical one-line diagram representation showing circuit breaker positions on generators, feeders and ties.
- Programmable 3-phase generator and utility relay protection functions.
- Data trending up to 16 parameters, with auto/manual triggering of data storage on compact flash.
- Compact flash slot and card for capturing screen displays and data for remote analysis.
- Remote monitoring via building management network (Modbus RTU Serial RS485 and/or Modbus TCP/IP Ethernet).
- Remote diagnostics using industrial-grade analog modem or Ethernet IP connection.
- Peer-to-Peer networking between units, supporting CAN, DeviceNet, Modbus or Ethernet protocols.



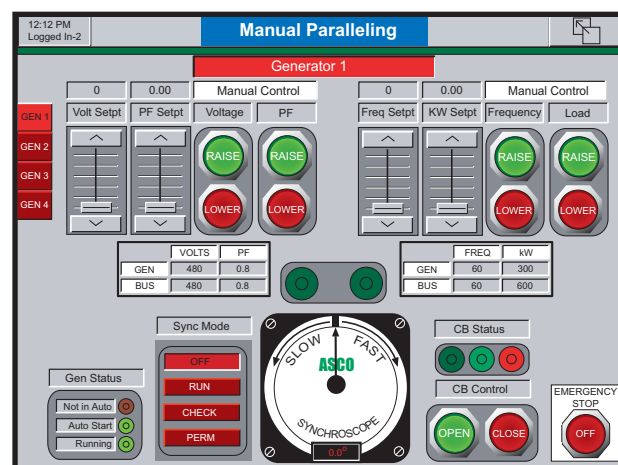
Main Menu. Easily navigate through all screen displays from the Main Menu. Log in here to gain access to various levels of information.



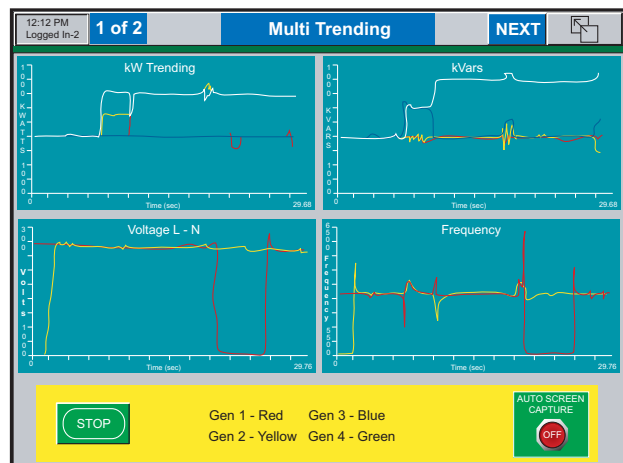
Dual Metering. Simultaneously view metering for any two generators. When viewing bus metering on the right side, a synchroscope will show if the source on the left side is in phase with the bus.



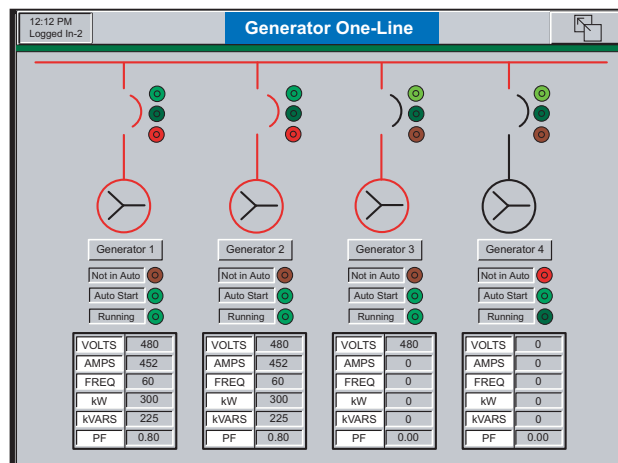
ATS Status. If the ATS's are provided with communications capability, this advanced ATS Status screen provides additional information, such as source availability and ATS position.



Manual Paralleling. Manually adjust the voltage and frequency of the on-coming generator and manually initiate the closing of the paralleling breaker.



Multi-Trending. Trend up to four parameters per screen at the same time with the option to automatically perform a screen capture to a compact flash card every five minutes.



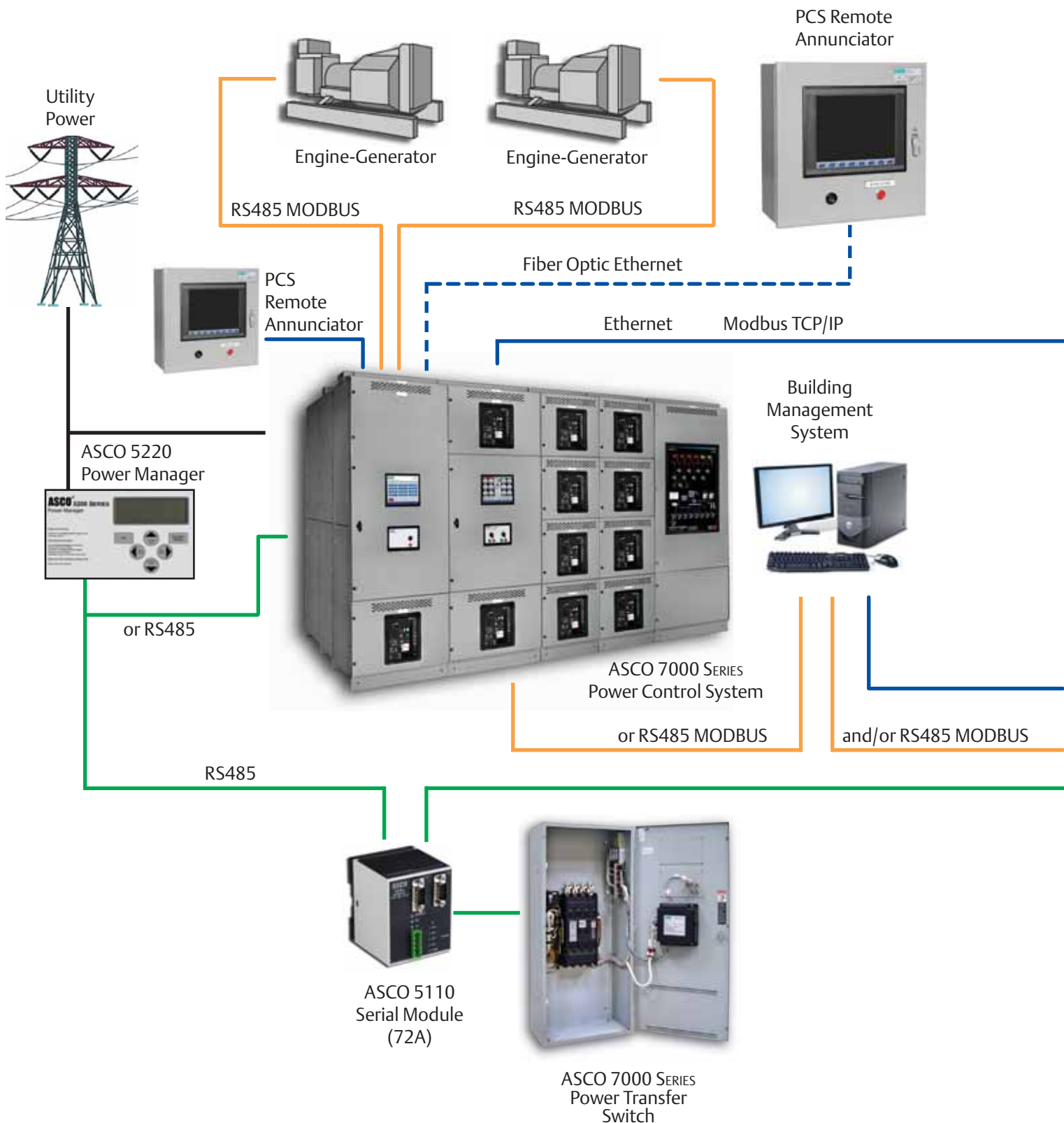
One Line. See up to four generators on a single screen with power flow indication, metering, and status information.

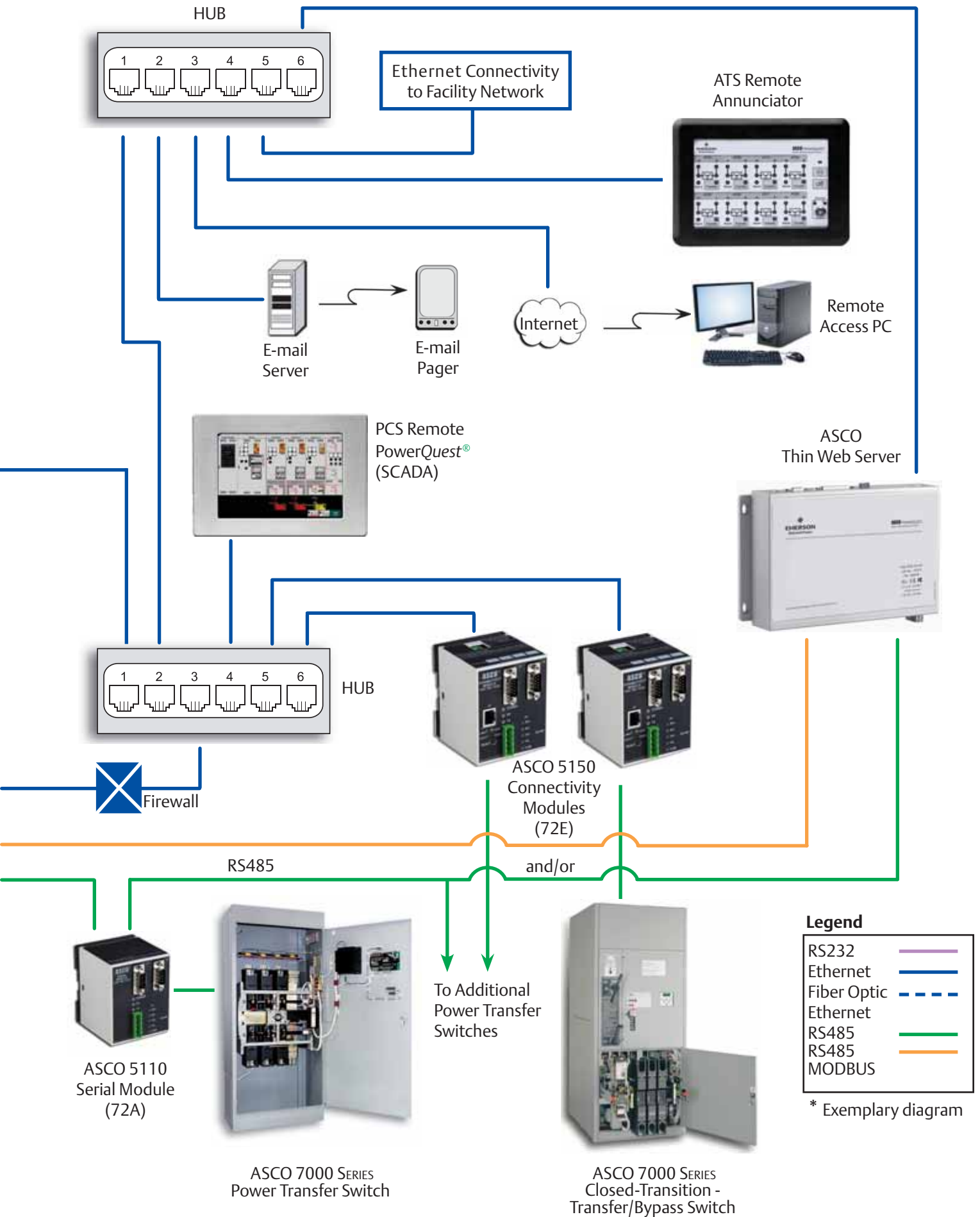
Network Your Emergency Power System*

ASCO communications products make it easy to monitor your prime power, emergency and/or standby power distribution systems onsite or remotely.

Local area networks and remote networks are supported with either single or multiple points of access.

Web-enabled communications allow access to your power system from anywhere in the world.



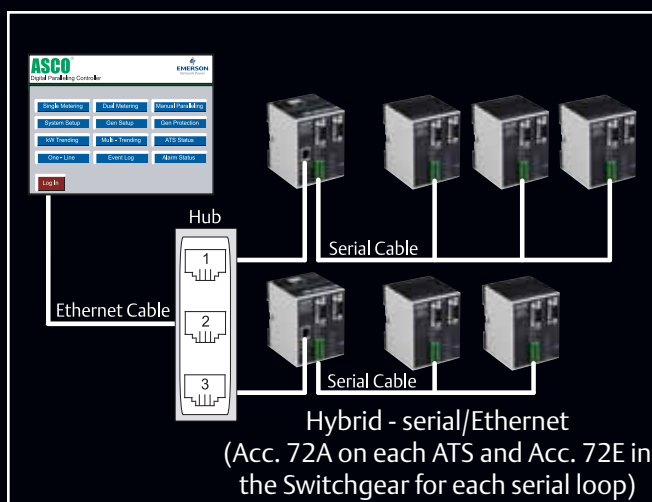
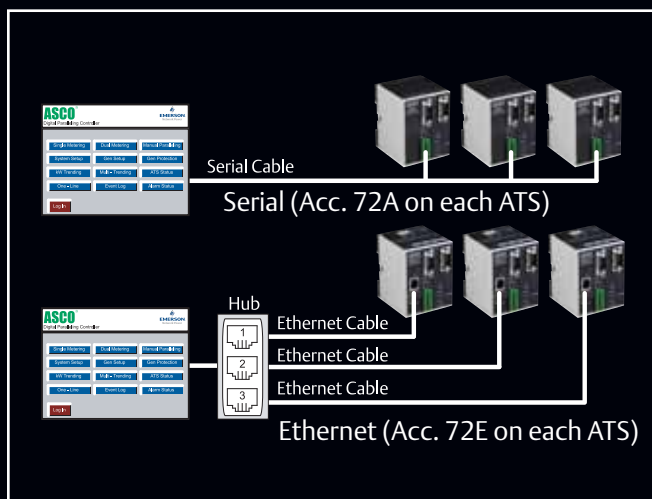




World-class technology for reliable power transfer

Typical Network Configurations

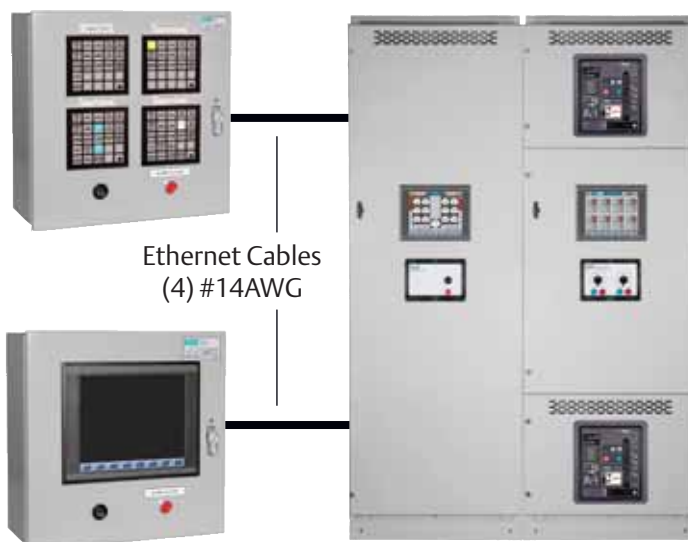
7000 SERIES Generator Paralleling Switchgear can be interfaced with the downstream power transfer switches by using the serial based, Ethernet and/or hybrid (serial/Ethernet) network communication methods as shown in the diagrams below:



Switchgear Remote Annunciation

7000 SERIES PCS Switchgear design offers two types of Remote Annunciation Panels in NEMA 1 enclosures. Both types of Remote Annunciation Panels are capable of communicating with the paralleling SWGR via Ethernet.

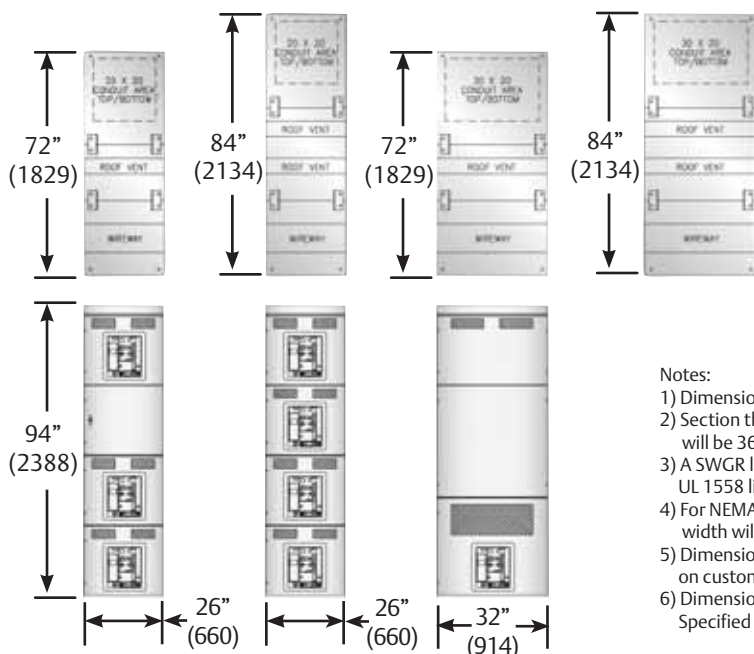
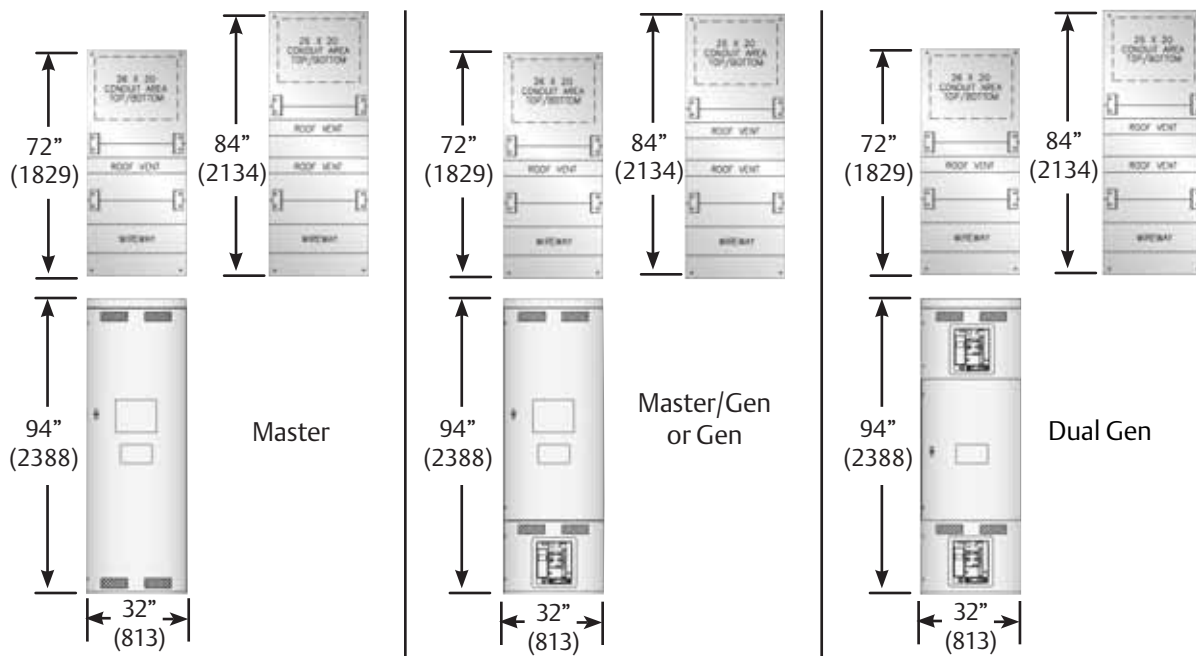
- LED type Remote Annunciator has traditional discrete LED status tiles to provide system and individual generator's remote status, alarm (horn with silencing push-button) and display functions.
- Touch screen type Remote Annunciator with one 12-15 in. color display, which fully duplicates the Master OIP to provide system and individual generator's remote status, alarm (horn with silencing push-button) and display functions.



Dimensions

At Main Bus, A	Master Controls	Master/Generator Controls	Generator Controls (Single, Dual)	Utility Tie Breaker Controls	Distrib. with 800-2000AF CB	Distrib. with 3200AF CB	Graphic with 42" LCD
Up to 6,000A	32/72	32/72	32/72	32/72	26/72	32/72	32/72
7000-10,000A	32/84	32/84	32/84	32/84	26/84	32/84	32/84

MASTER/GENERATOR DIMENSIONS in(mm)



DISTRIBUTION DIMENSIONS in(mm)

Notes:

- 1) Dimensions are for NEMA 1 type enclosures only
- 2) Section that includes 4000/5000AF Circuit Breaker(s) will be 36 in. in width
- 3) A SWGR line-up consisting of a 5000AF CB will not be UL 1558 listed
- 4) For NEMA 3R (outdoor) type enclosure each SWGR section width will increase four inches.
- 5) Dimensions above are typical. They may vary depending on custom specifications and design limitations
- 6) Dimensional data is approximate and subject to change. Specified dimensions available upon request.

ASCO 7000 SERIES Generator Paralleling Co

System Operational Modes

- Automatic standby
- Prime power
- Parallel with utility

System Control

- Load management control (automatic generator load demand and bus load optimization) for up to 128 ATS's or electrically operated feeder circuit breakers
- Manual load shed bypass control with bus under-frequency protection
- Hard-wired engine start and load shed relays
- System test without load (off-line)
- Test with load (on-line)
- Emergency stop
- Audible alarm horn
- Automated manual paralleling provisions

Engine Generator Control

- Automatic engine start
- Automatic synchronizing and paralleling
- Engine governor control, load sharing, soft loading/unloading
- No external load share components required
- Adjustable engine cool-down timer

System Controls Redundancy

- Master PLC redundancy: hot standby or hot standby synchronized
- Multiple (Master OIP type) touch screens for the generator controls
- Real time clock

- Two automated manual paralleling provisions: via touch screen with a Synchroscope or via push-buttons, mounted on the master door

The Master Control Touch Screen Operator Interface Panel (OIP)

- ASCO DPC 12" or 15" (optional) TFT color
- Real time clock
- Customized screens with JCAHO records capability
- Basic OIP Screens:
 - Main menu
 - System overview screen with the one-line diagram
 - Metering (bus and generators)
 - Manual paralleling control
 - ATS status
 - System setup control
 - Bus protection and setup
 - Engine generator protection and setup
 - Utility control and setup
 - Utility metering
 - Utility protection and setup
 - Utility status and alarms
 - Engine generator alarms and shut-downs
 - kW trending
 - Multiple parameter service trending
 - Event data log
 - Full range of service
 - Log in

- Compact flash card portable memory capability for storing and capturing any of displayed screens, including event data logs.

The Generator Control Touch Screen

- ASCO DPC 12" or 15" TFT color (optional)
- Screens to control and monitor each or each pair of generators
- Compact flash card portable memory capability for storing and capturing any of displayed screens, including event data logs.

Metering

- Voltage (A-B, B-C, C-A or A-N, B-N, C-N)
- Current A,B,C
- Frequency
- kW, kWh
- kVA
- kVar
- Power factor
- Synchroscope
- Engine battery voltage
- Running time meter

System Bus Protective Relaying

- 0.25% accuracy
- Based on true RMS sensing
- Device 27/59 - bus under/over voltage relay (three phase)
- Device 81O/U – bus over/under frequency relay

Generator Protective Relaying

- 0.25% accuracy
- Based on true RMS sensing
- Device 27/59 - under/over voltage relay (three phase)

- Device 81O/U – over/under frequency relay
- Device 32 – reverse power relay
- Device 40Q –loss of excitation (reverse VAR) relay
- Device 15/25V – auto and manual synchronizing relays

Engine Protection Alarms (if properly equipped)

- Low coolant temperature pre-alarm
- High coolant temperature pre-alarm
- Low oil pressure pre-alarm and shutdown
- Low fuel alarm
- Low engine battery alarm
- Over-crank shutdown
- Over-speed shutdown

Utility Protective Relaying (for parallel with utility mode with utility-tie controls only)

- 0.25% accuracy
- Based on true RMS sensing
- Utility grade type, discrete or multi-functional solid state, field adjustable relays
- Device 32 – reverse power relay (three phase)
- Device 27/59 - under/over voltage relay (three phase)
- Device 81O/U – over/under frequency relay
- Device 47 –negative sequence voltage relay
- Device 67 - directional overcurrent relay
- Device 86 – lockout relay

ntrol Switchgear Specifications*

PCS Power Supply

- Best DC source selector system
- Power from 24VDC engine start batteries
- DC-DC converter

System Communications

- Serial modbus RTU master/slave (RS 485/232 ports)
- Ethernet 100-base-T supporting modbus TCP/IP
- CAN network peer-to-peer protocol
- DeviceNet master/slave

Remote Power Monitoring Options

- Standard or customized PC based SCADA (ASCO PowerQuest®) remote power monitoring system via Ethernet
- 42 in. LCD mimic graphic panel (mounted in the switchgear line-up or stand alone) to display the emergency power system elements, including ATS's.
- Firewalled communication capability with building management system network via Ethernet or data concentrated (Gateway PLC) modbus slave
- Remote Internet/intranet connectivity via internal or external ASCO Thin Web Server

Remote Generator Alarm & Status Annunciation

- Up to two optional Remote Annunciator panels, touch screen type or LED lamp type, with monitoring capability to provide the total system and individual generators' status, alarms and display functions
- Capability to locate Remote Annunciation panels up to 6500 feet (2000 m) from the paralleling switchgear via fiber optic Ethernet communication
- Compliance with NFPA 99

Additional Optional Features

- Breaker lifting devices (portable or overhead)
- Load bank circuit breaker
- Electrically or manually operated distribution breakers
- Spare parts
- Circuit breaker test kit
- Custom sized 24VDC station battery system (including batteries, rack and charger).
- Extended (up to 5 years) ASCO Warranty.

Circuit Breakers

- UL 1066 (ANSI C37) rated, drawout, power circuit breakers (any specified brand) with frame size up to 5000A.
- Up to 200 kAIC rated (including fused breakers)
- Electrically operated on generators and distribution

- 5 cycle closing
- Auxiliary and bell alarm contacts
- Electronic trip units with LSIA functions on generators and LSIG or LSI trip functions on distribution
- Power metering and communication capability

Enclosure and Bus

- UL 1558 constructed, listed & labeled
- Up to 600V, 3-phase, 4-wire AC system, 100% copper neutral and 25% ground bus
- Up to 10,000A main bus
- Silver plated copper bus with up to 200kAIC bracing level for 4 cycles
- Bus duct risers available – up to 6000A
- Top and bottom conduit cable entry
- Mechanical set screw type or compression type lugs
- Enclosure types: NEMA 1, NEMA 3R, (consult ASCO for design limitations)
- Pull Boxes for NEMA 1 type enclosure
- ANSI gray
- Shipping splits at each section to ease installation

Environment

- Temperature range 0°F to 125°F (-18 0°C to 52°C)
- Humidity range 0 to 95%, non-condensing

* For detailed specifications please request publication 3179

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